ESP32 Wetterstation

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1. Features

Webservices

ASyncWebserver	http://192.168.1.1/	
Update OTA	http://192.168.1.1/update	
JSON Server	http://192.168.1.1/api/sensors	

Sky Quality Meter (SQM)

• Istil et al. "Night Sky Photometry with Sky Quality Meter." (2005).

see details in How to calibrate the SQI

Air Quality Index (AQI)

- $\bullet \qquad \qquad \text{https://document.airnow.gov/technical-assistance-document-for-the-reporting-of-daily-air-quailty.pdf}$
- https://www.airnow.gov/sites/default/files/2020-05/aqi-technical-assistance-document-sept2018.pdf

PM_{2.5} / PM₁₀ (µg/m³) AQI Breakpoints

AQI Range	PM ₂₋₅ (μg/m³)	AQI Range	PM ₁₀ (μg/m³)
0 - 50	0.0 - 12.0	0 - 50	0 - 54
51 - 100	12.1 - 35.4	51 - 100	55 - 154
101 - 150	35.5 - 55.4	101 - 150	155 - 254
151 - 200	55.5 - 150.4	151 - 200	255 - 354
201 - 300	150.5 - 250.4	201 - 300	355 - 424
301 - 400	250.5 - 350.4	301 - 400	425 - 504
401 - 500	350.5 - 500.4	401 - 500	505 - 604

Dewpoint Calculation

https://en.wikipedia.org/wiki/Dew_point



2. Hardware

Sensors

ADS1015 (i2c)

• 4 port 12 bit AD converter

BME680 (i2c)

Enviroment sensor

- Temperature
- Humidity
- Pressure
- CO2

HM330X (i2c)

Laser dust detection sensor

- PM1
- PM25
- PM10

Davis Instruments Wind Sensor 6410 (d0, a3)

Wind direction vane, wind speed sensor

- Wind speed: Reed sensor based rotation encoder
- Wind direction: 20 kΩ potentiomete

Modern Devices Wind Sensor Ref.B (a0, a1)

Aneometer

- Wind speed
- Temperature

MLX90614 (i2c)

Infrared thermopile temperture sensor

- Ambiente temperature
- Object temperature

RG 11 (d2)

Optical Rain Gauge -> https://rainsensors.com/products/rg-11/

RS 12 (d3)

Rain sensor

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SCD41 (i2c)

Photoacoustic NDIR senso

- CO2
- Temperature
- Humidity

TSL2591 (i2c)

High dynamic range digital light sensor

- VIS
- NIR

3. Installation



- VSCode
- PlatformIO Plugin

Modification:

After installing the libraries change in

.pio/build/seeed_xiao_esp32s3/ElegantOTA/src/ElegantOTA.h

0 to 1

```
# ifndef ELEGANTOTA_USE_ASYNC_WEBSERVER
    #define ELEGANTOTA_USE_ASYNC_WEBSERVER 1
# endif
```

Should be created

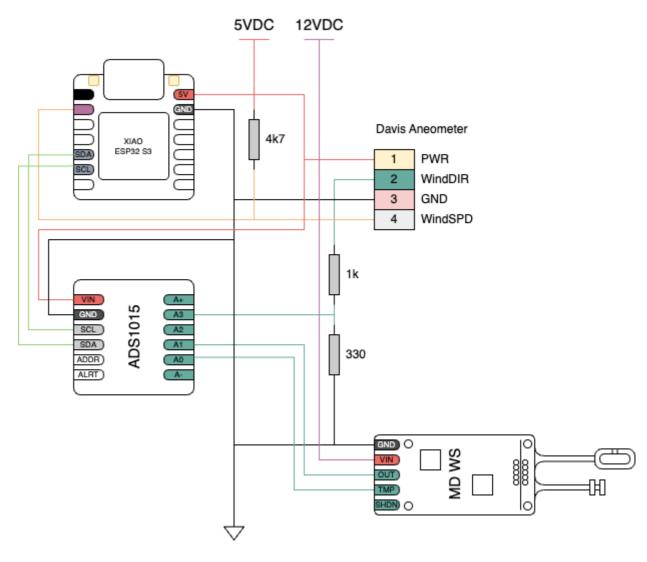
```
/* mysecrets.h */
# ifndef MYSECRETS_H
# define MYSECRETS_H

// WiFi credentials
const char *ssid = "xxx";
const char *password = "xxx";

// HTTP credentials
const char *http_username = "xxx";
const char *http_password = "xxx";
# endif
```



4. Pinsetting



ESP32

-> Interrupt input (Davis Instruments Wind Sensor 6410)

D2 -> Interrupt input (RG 11)

-> Interrupt input (RS 12)

D4 -> SDA (I2C)

D5 -> SCL (I2C)

AD1015

AI0 -> Modern Devices temperature

AI1 ->

-> Modern Devices wind sensor

-> Davis Instruments wind direction



5. References

- Seeedstudio Wiki
- Random Nerd Tutorials
- Community PlatformIO

- ElegantOTA
- ChatGPT
- Cactus.io (offline)
- INDI Library Weatherradio

Special articles

Gauge sensors



6. License

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7. Changelog

[0.2] - xxx-xx-xx

Updates

- SQM
- AQI
- Dewpoint
- Documentation



Initial Release

